invite comments to SR Telecom's proposal. *Id.*

19. **Resolution.** One of the stated goals of the *MDS Report and Order* and its associated *Notice of Proposed Rulemaking* was to establish video programming on the MDS spectrum as a competitive choice to cable services.[10] As was stated in the *Notice,* "[a]lthough competing technologies have made major strides since the previous report on cable competition in 1990, the cable television market remains largely noncompetitive . . . .. This rulemaking is one of several administrative improvements directed toward enhancing the development of wireless cable operators as viable competitors in the video programming marketplace." *Notice* at 7666-7667 (citations and footnotes omitted). However, previous MDS rulemakings have also noted that operators should be afforded the flexibility to provide other services. *See, e.g., In the Matter of Revisions to Part 21 of the Commissions Rules,* 2 FCC Rcd 4251, 4255 (1987) ("We believe a similar flexible approach is particularly appropriate to MDS . . . . In the non-entertainment market, MDS may compete with short-haul microwave, coaxial cable, Digital Termination Systems, fiber optic cable and fixed satellites."); *see also, Report and Order in the Matter of Parts 1, 2, 21, and 43 of the Commissions Rules,* 45 FCC Rcd 616, 619 n.6 (1974) ("MDS is not limited to television transmission and should be capable of many diverse forms of transmission such as the omnidirectional distribution of high speed computer data, audio, control signal, facsimile, etc.").

20. In the *MDS Report and Order* we changed none of our rules regarding the use of MDS frequencies, and we do not do so here. We will allow alternative uses other than wireless cable video transmission if the applicant can satisfy MDS technical rules or adequately support waivers of those rules. We will examine waiver requests for these uses on a case by case basis. However, we will not grant waivers of technical rules where we find that applicants merely are attempting to warehouse these frequencies. We emphasize that any party entering the MDS auction should do so with the expectation that all station license applications must protect against harmful electrical interference to incumbent MDS operations as well as ITFS receive sites and the service areas associated with channel leases. The Commission has received a joint petition for declaratory ruling filed by a group of ninety-nine entities involved in the wireless cable industry, asking for clarification of the use of digital transmission by MDS and ITFS stations, and has placed the request for declaratory ruling on public notice, asking for comments. *Public Notice, Pleading Cycle Established for Comments on Request for Declaratory Ruling on the Use of Digital Modulation by MDS and ITFS Stations,* Report No. MM 95-83, DA 95-1854 (released August 23, 1995). Therefore, we find that clarification of the use of digital transmission technology on MDS frequencies beyond the scope of this proceeding.

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[10] *See, e.g., MDS Report and Order; Notice of Proposed Rulemaking* in MM Docket No. 94-131 and PP Docket No. 93-253, 9 FCC Rcd 7665 (1994) (*"Notice"*) at ¶ 1, 6, 8.

Rural network expansion in Canada

More than 140 SR Telecom systems distribute over 6,000 telephone and data lines to businesses and homes outside the cabled networks of the 15 major Canadian telephone companies.

Typical of rural telephone development in Canada is the case of the province of Manitoba where, in 1977, the first SR100 system served to defer, for some years, the necessity of installing a new distribution cable in the Whiteshell area.

In 1989, by contrast, the same company chose the SR500 system as the long-term solution to distribute some 170 lines in the Thompson region. By 1992, after two expansions, the system ensured distribution of a full range of telephone services to over 450 subscriber lines, using 4 repeaters and 7 outstations, similar to the one at Setting Lake, shown below.

In all, 15 SR Telecom systems form part of the telephone network in Manitoba.
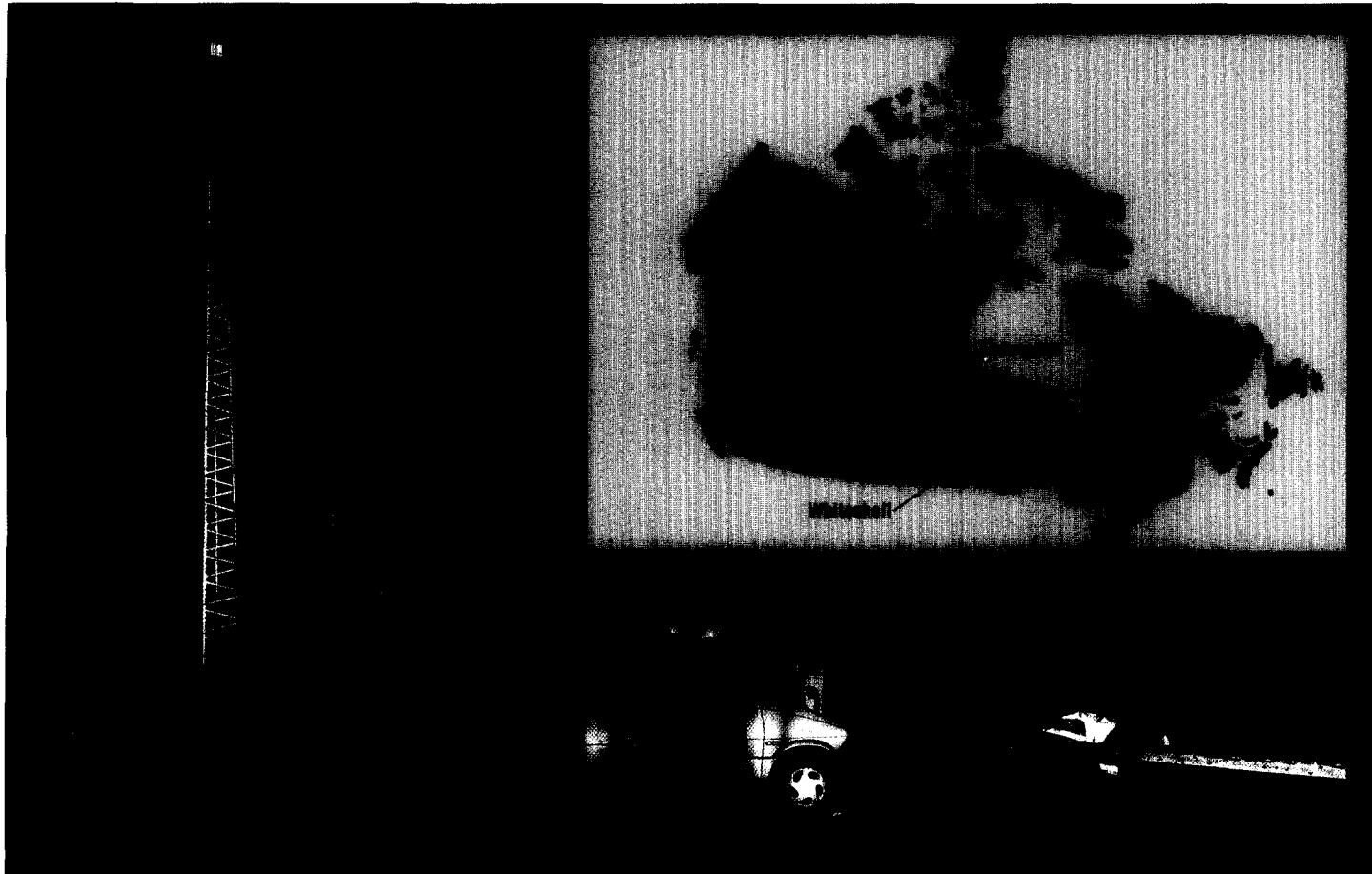
Replacing old networks in Sweden

In 1982, the Swedish telephone administration addressed the problem of providing telephone service to sparsely populated remote areas by installing an SR100 system at Karesuando, in northern Sweden.

Now, more than 20 systems distribute over 4,000 telephone lines, eliminating costly maintenance of aging aerial plant and small exchanges, while at the same time offering value-added services.

The photograph shows the Ryfjället region, where an SR500 system distributes a full range of modern services to over 500 subscribers. Like most of the SR500 systems in Sweden, it provides a direct digital interface to an AXE exchange.
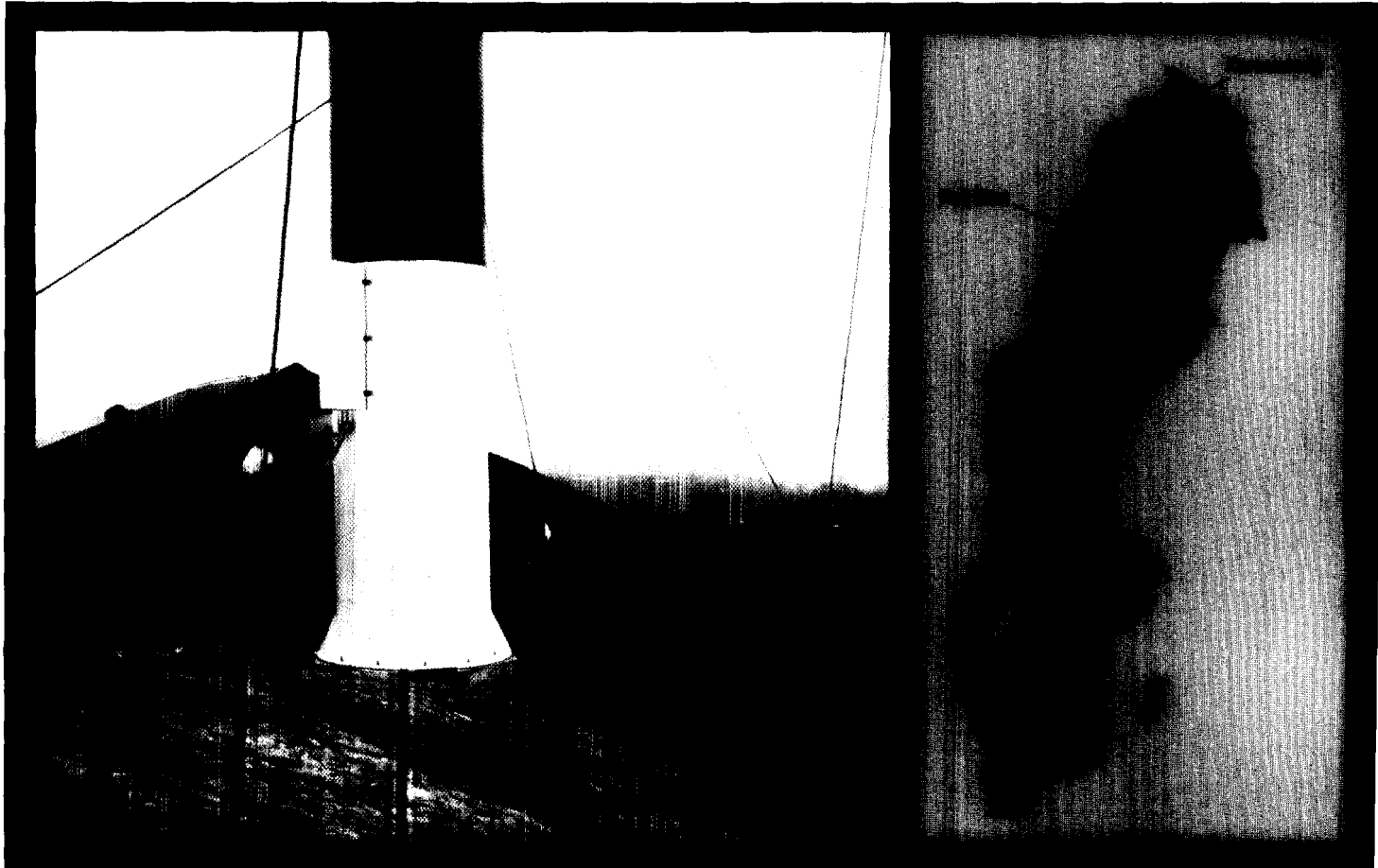
Urban and rural telecommunications in the Philippines

In 1980, the first SR100 system in the Philippines distributed telex services to scattered businesses in the Manila region. Today, 10 SR100 and SR500 systems distribute a wide range of data and telephone services to more than 100 industrial, financial, and government offices in Metro Manila. For many multinational organizations, the systems complete satellite links to Asia, Europe and the Americas.

Outside the capital region, 16 more SR100 and SR500 systems distribute high-quality voice and data services to several hundred municipal public call offices, resort hotels, agricultural producers and local government administrations. People in these areas now benefit from the same telecommunications services as those offered in the capital.
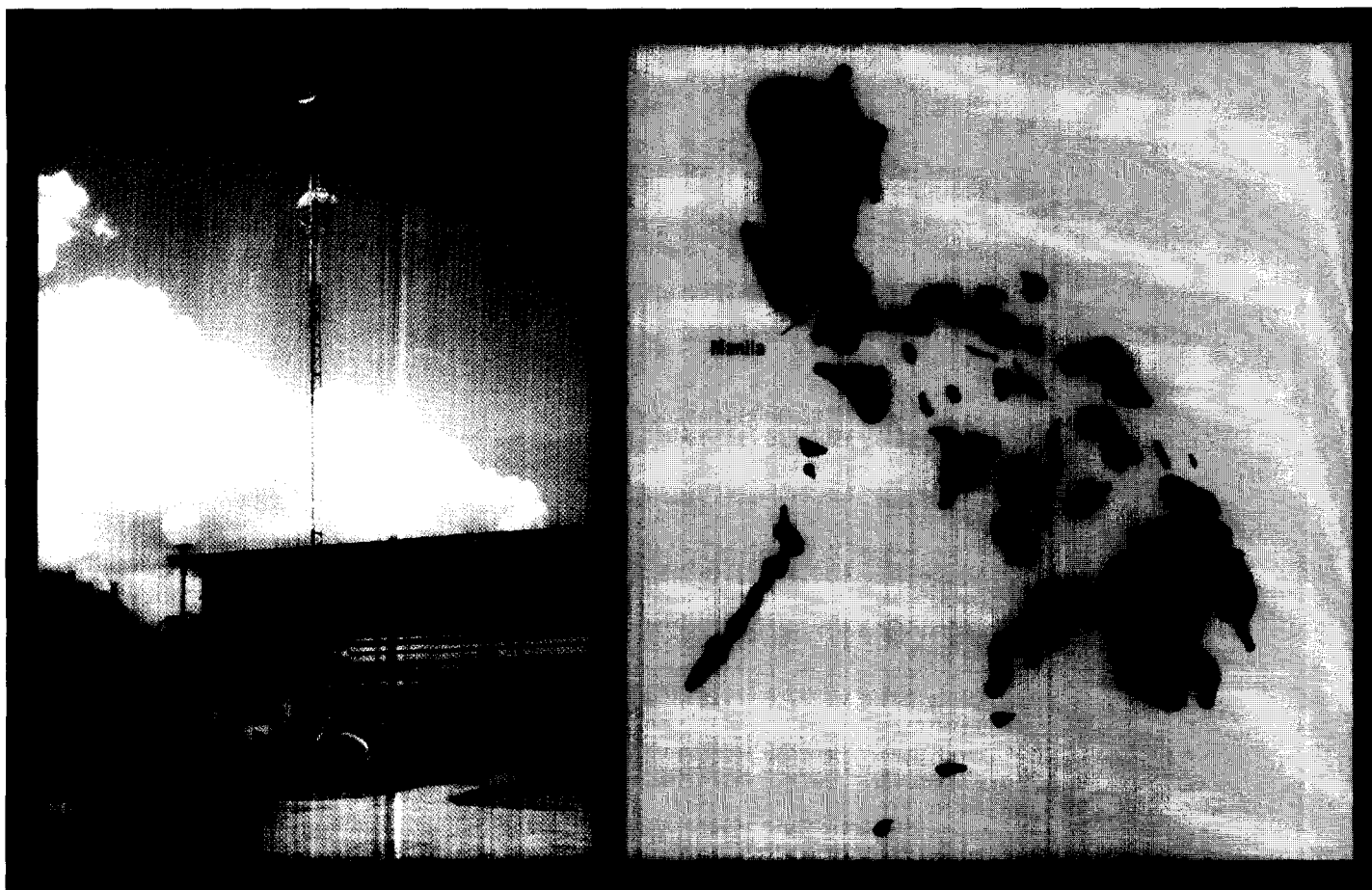
Telecommunications programs in Mexico

In 1989, the Mexican government stressed telecommunications in
its ambitious new national development program, along with other
key infrastructure improvements

After winning three competitive international tenders in Mexico,
SR Telecom contracted to supply some 20 initial SR500 systems,
in 1992, to connect over 600 towns and villages, located in 14 states,
to the national network.

Reliable telephone service in outlying areas reduces migration to
cities because small local businesses can operate more effectively,
react quickly to distant customers, and employ more local people.

SR Telecom around the world

SR Telecom

Europe-Africa

Kenya
Tel: (254)2-520614
Fax:(254)2-522481

Stockholm
Tel: (46)8-718-1926
Fax:(46)8-718-2446

Tunisia
Tel: (216)1-885-562
Fax:(216)1-885-344

Asia-Pacific

Bangkok
Tel: (662)619-0226
Fax:(662)619-0230

Beijing
Tel: (8610)466-9096
Fax:(8610)466-9198

Manila
Tel: (632)892-4889
Fax:(632)892-5771

Americas

Denver
Tel: (303)740-6691
Fax:(303)740-6789

Mexico City
Tel: (525)207-9683
Fax:(525)207-5696

Miami
Tel: (305)423-4300
Fax:(305)423-4238

SR Telecom Product Presentation

SR500 s

Digital Point-to-Multipoint Microwave Radio

SRT

SR500 s Corporate Overview

- Inventor of TDMA Subscriber radio supplied since 1977 - now a world leader

- We Design, Manufacture, Market, Install and Service SR radio systems

- Two Manufacturing Facilities Totaling 210,000 Sq Ft. with 940 people employed

- 11 regional offices in North America, Europe, Africa and Asia

- SR Telecom Follows ISO 9000 Quality Standards

SRT

SR500s Current Markets Served

- **Telephony Fixed Applications- Rural and Urban**
  - **Economic alternative for domestic Telco's**
  - **PTT rural development programs**

- **Business and Data networks**
  - **Private Networks**
  - **High speed data**

- **Industrial - Supervisory and Data Acquisition**
  - **Natural Gas and Pipe line**
  - **Petroleum**
  - **Electricity**
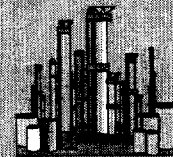
SR500s SRT Around the World

- **Adopted by 170 customers in over 80 countries**

- **Proven technology with 1,500 systems and 17,000 remote stations installed**

SR500s Technology

- Toll grade 64 kbps encoded voice and extended services
  - equivalent quality to cable plant
- Transparent to vertical services provided by digital switches
- Supports high speed data and ISDN
- Flexible planning - variety of Outstation capacities
- Weather hardened remotes for outdoor installations
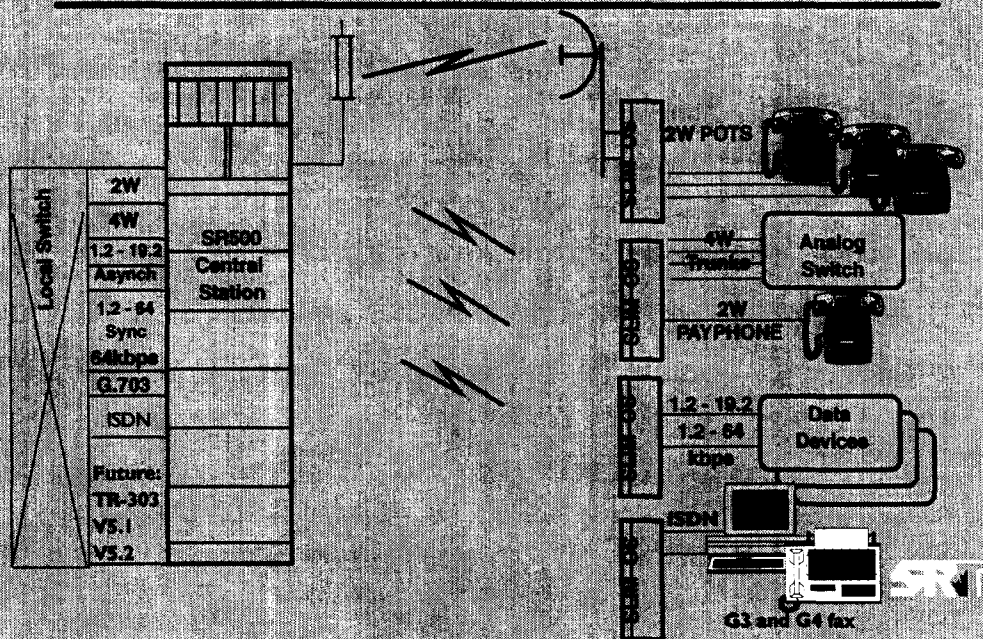- Built-in backbone infrastructure - wide area coverage

SR500s Digital Point-to-Multipoint Microwave
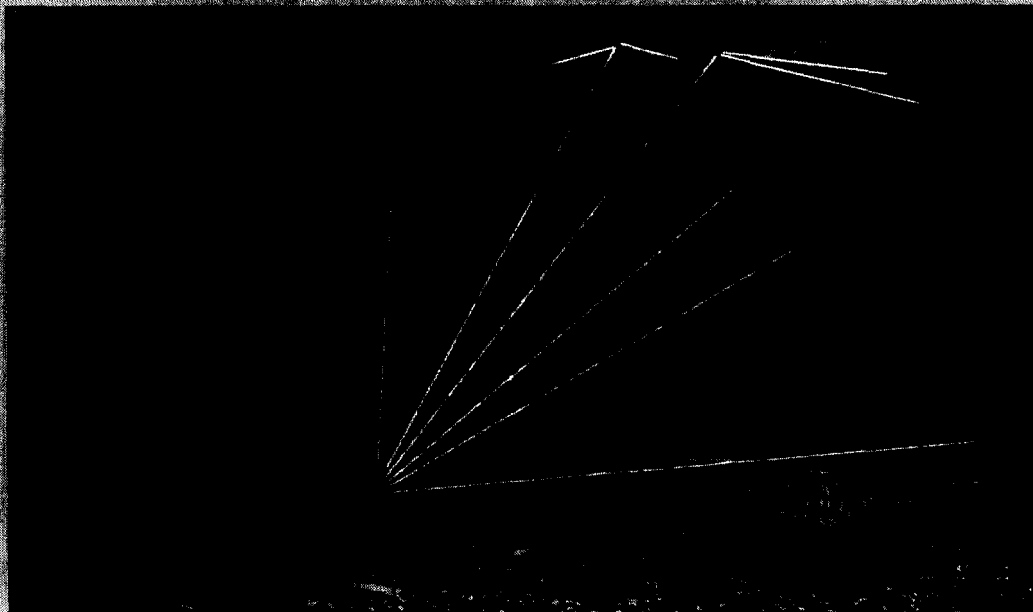
SR500s Interface Options

SR500s System Specifications

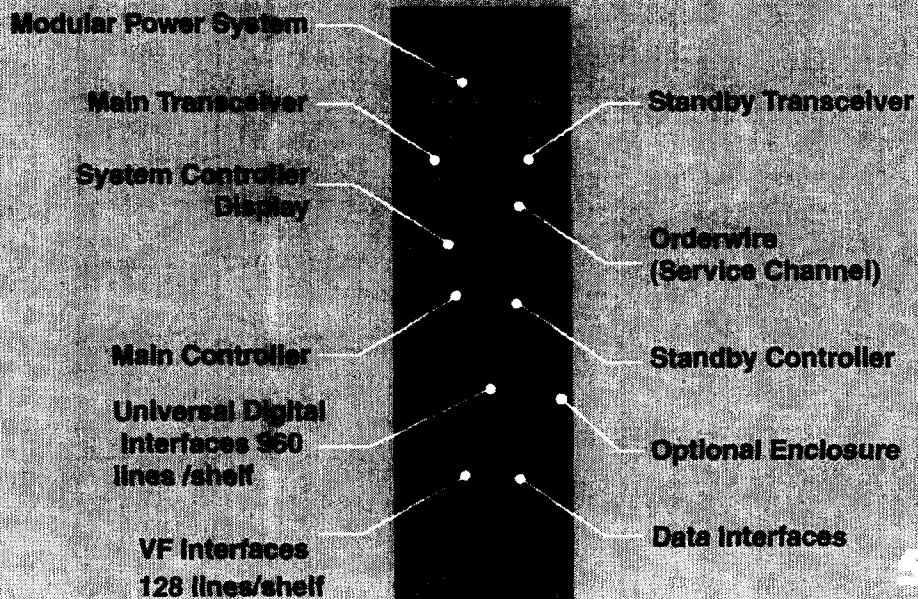|	
	1.375 to 2.690 GHz (CCIR Rec. 701) and 10.5 GHz (ETSI)
	2 per Node
	3.4 MHz
	Modified OQPSK
	20/30/35 dBm
	· AC (120 or 240 V) · +12 VDC (solar plant) · -24 or -48, -18 to -72 VDC

SR500s System Specifications

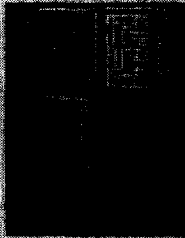|	
	60
	1024
	511
	64 kbps PCM
	CCITT µ- or A-law
	430 miles
	Indoor: -10 to +55 °C Outdoor : -40 to +55 °C
	8 or more hours with supplied maintenance free batteries

SR500s Central Station

Modular Power System

Main Transceiver

System Controller
Display

Main Controller

Universal Digital
Interfaces 960
lines /shelf

VF Interfaces
128 lines/shelf

Standby Transceiver

Orderwire
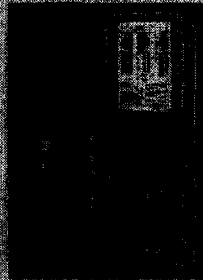(Service Channel)

Standby Controller

Optional Enclosure

Data Interfaces

SR500s SLIM Family
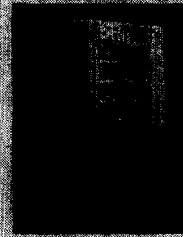
SLIM 10
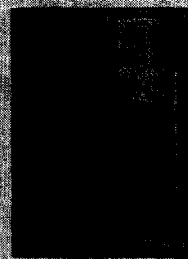
SLIM Auxiliary 34

SLIM 34

SLIM Drop Repeater

SLIM Through Repeater

SR500s SLIM Outdoor Installation

SR500s SLIM - Line Capacities

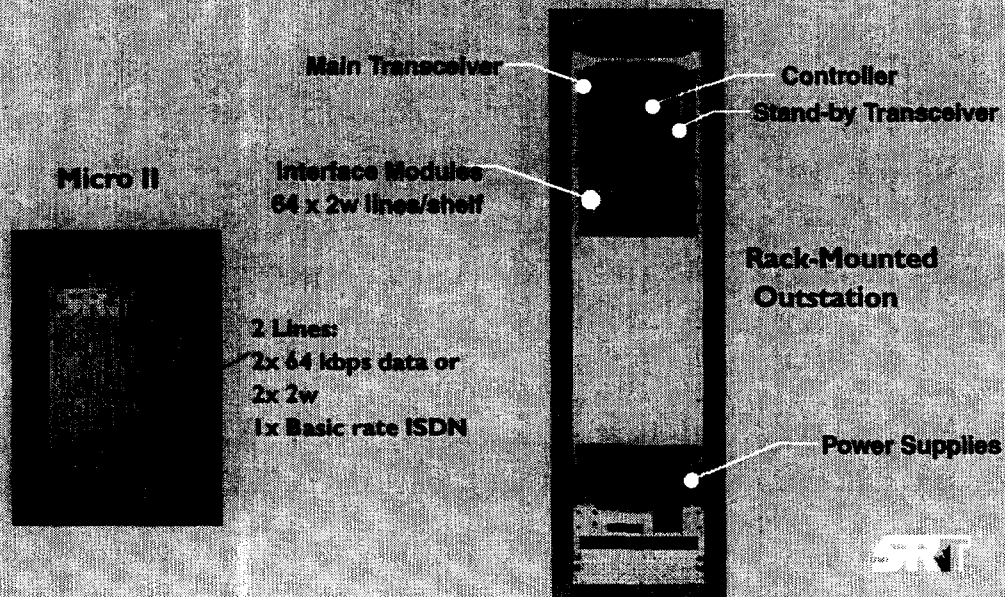|	10	9	4	4	2	4
	34	33	16	8*	8	16
	34	33	16	8*	8	16
	10	9	4	4	2	4
	**	–	–	–	–	–

* Four slots still remain available for the installation of VF interface modules.

** The controller of this station provides one 2-wire circuit for orderwire.

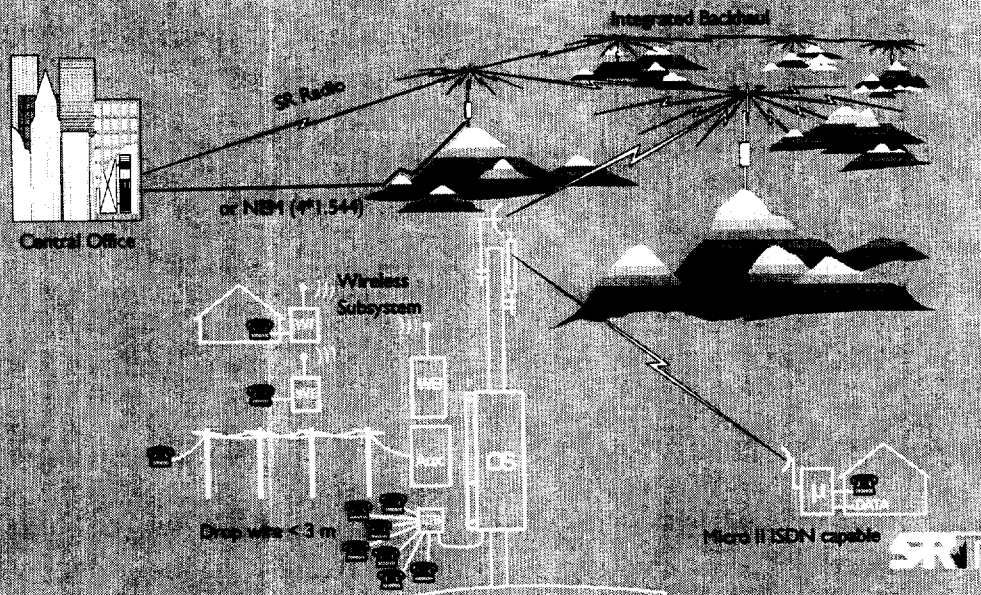## SR500s From 2 Lines to 256 Lines

Micro II

Main Transceiver

Controller

Stand-by Transceiver

Interface Modules
64 x 2w lines/shelf

Rack-Mounted
Outstation

2 Lines:
2x 64 kbps data or
2x 2w
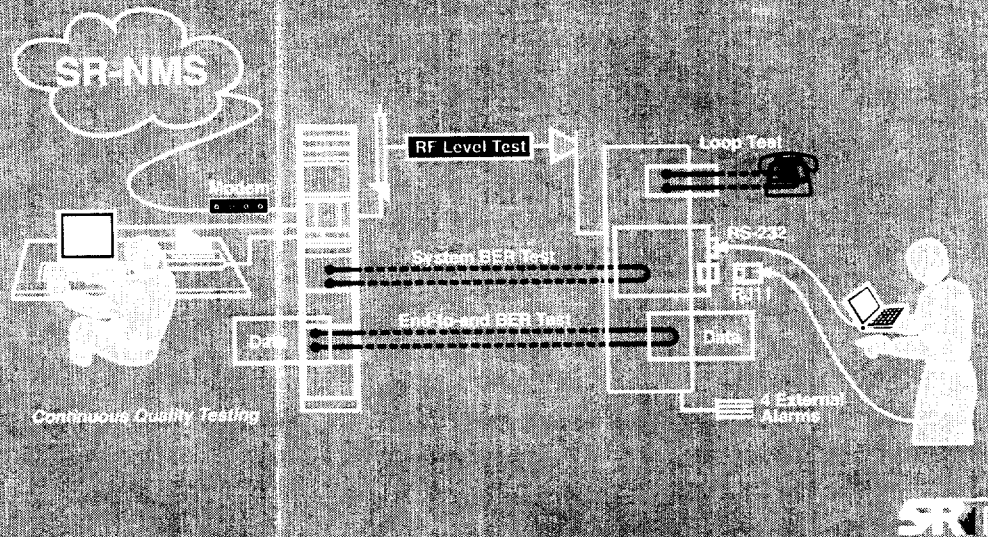1x Basic rate ISDN

Power Supplies

SR500 Network Possibilities

WL Subsystem - Key Features

- Service up to 10 km
- Full ADPCM quality
- TDMA frame structure
- Compatible with SR500-s infrastructure
- Quick and easy installation
- Future-proof technology
- Cost-effective alternative to dropwire

Built-in Network Management Reduces Maintenance Costs

SR500s

SR-NMS

RF Level Test

Loop Test

RS-232

System BER Test

End-to-end BER Test

Data

4 External Alarms

Continuous Quality Testing

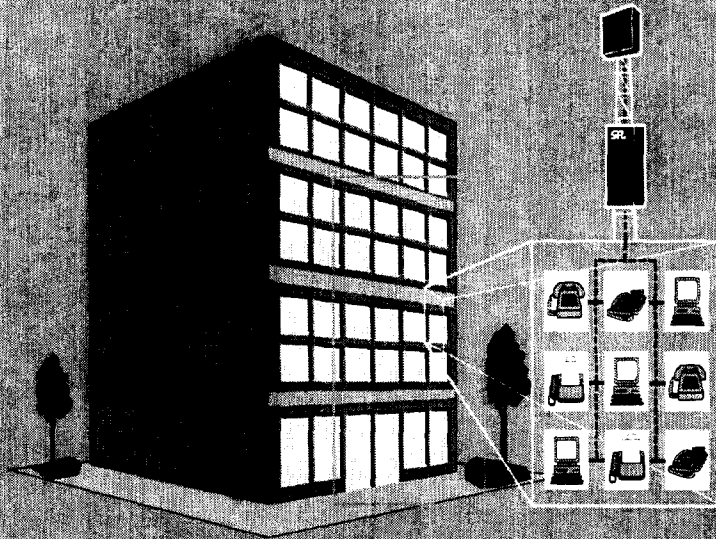## SR500s Changing Times – New Markets

- **PCS Fixed Applications– Urban and Rural**
  - Held order solutions
  - Local competition
  - Additional services over ordinary wireline facilities:
    - ISDN
    - High speed data

- **Wireless Cable Companies - 2.5 GHz**
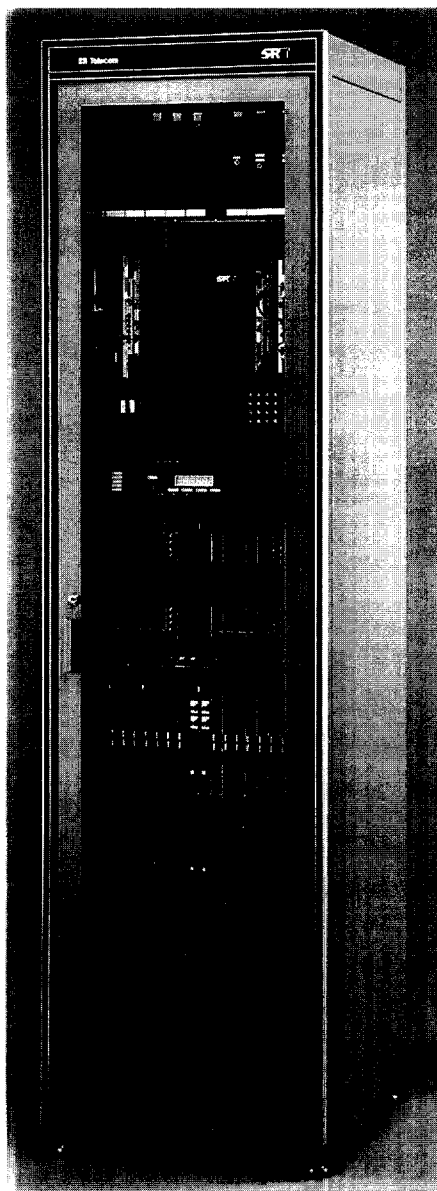 - Also getting into Telephony, providing additional competition and improved services

SR500s

SR500s

SR Telecom
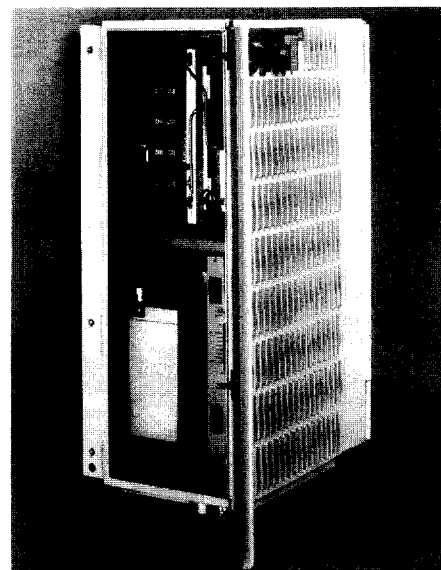
SR500s

PMP-TDMA Digital Subscriber Radio System, in frequency bands from 1.3 to 2.7 GHz, distributing telephone and data services to over 1,000 subscribers located anywhere in a radius of up to 720 km

- 60, 64-kbps trunks for use in either demand access or dedicated mode

- 511 remote stations, available in varying types and configurations

- One pair of radio frequencies per network node

- Wide choice of telephone and data interfaces: 2-wire, 4-wire, payphone, telex, synchronous, asynchronous, G.703

- Network-extension support via existing point-to-point networks

- Intracall and orderwire options

- Integrated network management tools, including continuous quality testing

- Weatherproof outdoor equipment operating over the full range of climatic conditions

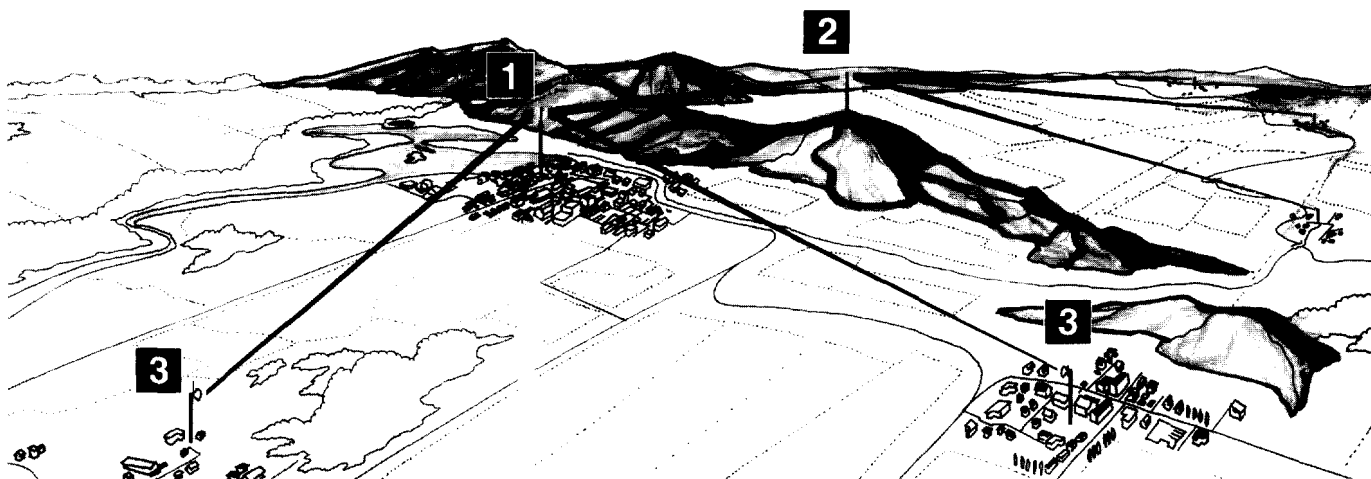*SLIM 10 outstation equipped with 9, 2-wire VF lines and 1 orderwire line*

R500-s protected central station installed in a standard 19"-wide rack enclosure and equipped with UDI and line/data shelves
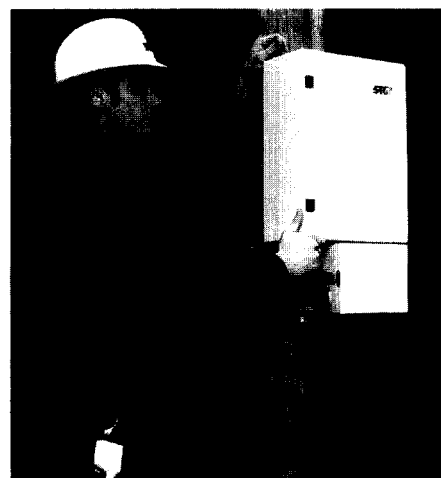
Micro-outstation equipped with 1, 2-wire line and 1, 64 kbps data circuit

1

1

CENTRAL STATION
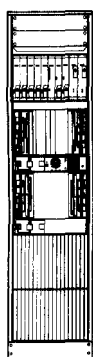
Capacity

Analogue Lines   1,024 payphone or 2-wire VF; 512 telex; or
                      256, 4-wire E&M

Data Lines   256 asynchronous, synchronous, or G.703 (64 kbps)

Digital Lines*   960 (E1) or 768 (T1)

Power

Input Voltage   -24 or -48 VDC; or 120/240 VAC at 50/60 Hz (option)

Typical Requirement[1]   80 W (analogue lines) or 60 W (digital lines)

* *Universal Digital Interface (UDI) supports both E1 (2048 kbps) and T1 (1544 kbps) primary rate
carriers in compliance with ITU-T recommendations: G.703, G.704, G.706, G.732, G.821, and G.823.
Signalling is adaptable to various digital exchanges.*

2

Rack-Mounted
Repeater
(RMR)

REPEATERS

Capacity

Analogue Lines   256 payphone or 2-wire VF;
                      128, 4-wire E&M; or 64 telex

Data Lines   128 asynchronous, synchronous, or G.703 (64 kbps)

Power

Input Voltage   -24 or -48 VDC; or
                      120/240 VAC at 50/60 Hz (option)

Typical Requirement[1]   100 W

SLIM Drop Repeater

Capacity[2]

SLIM Drop

SLIM Through

	2-wire	Payphone	4-wire E&M	Telex	Data
SLIM Drop	10	9	4	2	4
SLIM Through	1	-	-	-	-

Power

Input Voltage   +13.6 VDC; -18 to -72 VDC; inverted ground option; or
                      120/240 VAC at 50/60 Hz (using PJP)

Typical Requirement[1]   60 W

Reserve   35 to 140 Ah using PJP

3

OUTSTATIONS
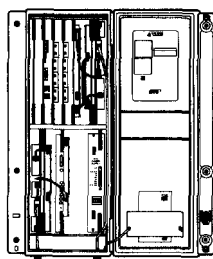
Rack-Mounted Outstation (RMO)

Capacity

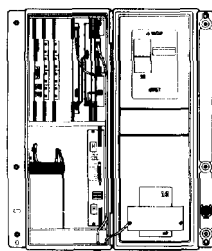| Analogue Lines | 256 payphone or 2-wire VF;
128, 4-wire E&M; or 64 telex |
| Data Lines | 128 asynchronous, synchronous, or G.703 (64 kbps) |

Power

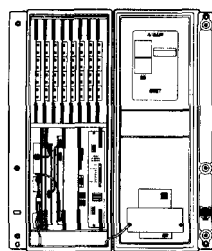| Input Voltage | -24 or -48 VDC; or
120/240 VAC at 50/60 Hz (option) |
| Typical Requirement[1] | 60 W |

SLIM 10

SLIM 34

Capacity[2]

	2-wire	Payphone	4-wire E&M	Telex	Data
SLIM 10	10	9	4	2	4
SLIM 34	34	33	16	8	8*

Power

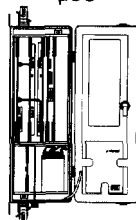| Input Voltage | +13.6 VDC; -18 to -72 VDC; inverted ground option; or
120/240 VAC at 50/60 Hz (PJP needed for SLIM 34) |
| Typical Requirement[1] | 15 W (idle) |
| Reserve | 17 Ah with internal battery or 35 to 140 Ah with external battery(ies) |

First four slots still available for VF interface modules

µOS

Capacity

2 lines of any service: 2-wire, payphone, 4-wire E&M, telex, data, or mixed services

Power

Input Voltage	+13.6 VDC; or 120/240 VAC at 50/60 Hz
Typical Requirement[1]	15 W (idle)
Reserve	7 Ah with internal battery or other with external battery(ies)

1 2 3

COMMON CHARACTERISTICS

* Environment:

| | Indoor | -10 to +55 °C |
| | Outdoor | -40 to +55 °C |

* A mixture of voice and data services is possible at any station.
* Optional protection at rack-mounted stations and SLIM repeaters (1+1 in monitored hot-standby, hot-standby or cold-standby mode)
* Line expansion is possible by adding a line or data shelf to a rack-mounted station or by connecting an auxiliary outstation to a SLIM station.

---

[1] *The given power consumption is based on typical residential traffic loading assuming fully-equipped cabinet stations and half-capacity central and rack-mounted stations with 30 dBm RF transceivers. The actual power consumption will depend on the traffic load, as well as the equipment options selected for primary power voltage, service lines, and standby equipment.*

[2] *The SLIM controller provides two 2-wire circuits. The first circuit can be programmed for orderwire or VF service; the second circuit for VF or payphone service. The SLIM controller in through repeaters provides only one 2-wire circuit that can be programmed for either orderwire or VF service.*

System Characteristics

CONFIGURATIONS

SR500-s systems can be configured in star, branched, or linear networks, to suit the local density of subscribers and topography of the service area. Furthermore, using G.703-compliant network extender modules (NEM), any two SR500-s nodes can be linked via existing cable, microwave, and lightwave point-to-point networks.

CAPACITY

The system architecture provides 60, 64 kbps trunks and an addressing capacity of 4,095 lines. All lines have access to all trunks.

In any particular application, the system line capacity is a function of the traffic generated by the connected subscribers and the grade-of-service objective for the area. The single group of 60 trunks provides a two-way traffic capacity in excess of 47 erlangs (1700 CCS). For subscriber lines generating an average traffic of 0.07E (2.5 CCS), for a 1% grade of service, 670 subscribers could be served.

For data applications, several low-speed data channels, located at different remote stations, can share the same 64 kbps trunk.

Intracall

The Intracall option connects calls locally between subscribers of the same remote station, reducing the traffic load on the 60 system trunks. Intracall is available at all remote stations, except at micro-outstations and SLIM through repeaters.

ATB Intracall

If all 60 trunks are busy, remote stations can connect local calls, using the SR500-s' internal signalling trunks and the Intracall option.

Stand-Alone Intracall

If the central station is out-of-service, Intracall can still connect local calls.

SUBSCRIBER SERVICES

Telephone

- 2-wire individual, two-party or multiparty lines
- 2-wire semi-postpay and prepay (50 Hz, 12 kHz, and 16 kHz metering)
- 4-wire E&M signalling

Data

- asynchronous data, 1.2 - 19.2 kbps
- synchronous data, 2.4 - 64 kbps with the capability of remotely programming the data rate
- 64 kbps co- and contradirectional as per ITU-T Rec. G.703 with, or without, E&M signalling

ISDN

- U-interface 2B+D (2B1Q) per ETSI and ANSI standards

Telex

- 50 - 300 bauds (20 telex lines use 1 DAMA trunk)

Transceiver Characteristics

RF input and output impedance

50 Ω, unbalanced

Frequencies

Operating Bands MHz	TxRx Channel Separation, MHz[3]
1375 - 1452	52
1427 - 1535	40, 49 or 65.5
1700 - 1900	108.5
1900 - 2100	101.5
2100 - 2300	105
2300 - 2500	77, 94 or 101.5
2500 - 2690	74, 119

A minimum channel spacing of 3.5 MHz is required in accordance with CCIR Reports 380 and 1057, and ITU-R Rec. 701.

Transmitter RF output power (at antenna port)

20, 30 or 35 dBm, guaranteed[4]

Modulation

Modified OQPSK

Frequency stability

5 ppm

Detection

Coherent

Receiver sensivity at antenna port

-87 dBm guaranteed[4] (for BER of 1×10^{-4})

Receiver operating range

-45 to -93 dBm

---

[3] Other channel separations are possible.

[4] "Guaranteed" performance characteristics are those which are met by all equipment operating anywhere within the applicable temperature range.

Interface and Transmission Characteristics

2-WIRE SERVICES

Meets applicable requirements of ITU-T Rec. G.713[5]

Companded PCM digital encoding standard	A-law or μ-law options, meets ITU-T Rec. G.711 (encoding) and G.713 (VF)
Transmission loss	3 dB between 2-wire terminal points Manually adjustable ±3 dB Remotely programmable for +3 dB
Level stability	Better than ±0.6 dB (during one year)
Linearity (variation of gain with put level)	±1 dB (level range -50 to +3 dBm0) in-
End-to-end frequency response[6]	≤ 1.1 dB loss (600 - 3000 Hz)
Group delay distortion[6]	≤ 1.5 ms (600 - 2800 Hz)
Idle channel noise (A-law option)	≤ -65 dBm0p (through encoder and decoder) ≤ -75 dBm0p (decoder)
Crosstalk	≤ -65 dBm0
Return loss (nominal impedance)[6]	> 15 dB (600 - 3400 Hz)
Dial pulse distortion	5% max. (8 - 12 pps and 55 - 70% break as measured on 850 Ω loop)
VF interface balanced impedance	600 Ω, 900 Ω, and complex options
Longitudinal balance[6]	≥ 46 dB (600 - 2400 Hz)
Signalling limit to telephone exchange	650 Ω for a minimum of 23 mA loop current
Subscriber loop signalling limit (including the telephone set)	1310 Ω for minimum 23 mA loop current
	3220 Ω for 12 mA loop current (option)
Loop signalling	Rotary dial and/or DTMF
Remote station ringing supply	90 V_{rms} at fundamental frequency of 16, 20, 25, 30, or 50 Hz (factory-set option)
Remote station talk battery	-48 VDC nominal
Payphone metering pulses	50 Hz, 12 kHz and 16 kHz (bi-directional)

---

[5] *In addition to ITU-T Rec. G.713, the SR500-s system meets the applicable requirements of the North American standard TR-TSY 00 00 57, issue 1, April 1987.*

[6] *Selected frequency range shown, but equipment meets full voice band specifications as per ITU-T Rec. G.713.*

6

4-WIRE E&M SERVICES

All specifications meet ITU-T Rec. G.712.

Companded PCM digital encoding standard	A-law or μ-law options, meets ITU-T Rec. G.711
Transmit and receive levels	Rx out +7 to -16 dBm Tx in -16 to +7 dBm
Transmit and receive return loss	$\geq$ 20 dB (300 - 3400 Hz)
Longitudinal balance	$\geq$ 46 dB longitudinal conversion loss (300 - 2400 Hz)
Crosstalk, interchannel	$\leq$ -65 dBm0 using 1 kHz tone
Idle channel noise (A-law option)	$\leq$ -65 dBm0p (nominal termination) $\leq$ -75 dBm0p (receiving equipment noise)
Level stability	Better than $\pm$0.5 dB during any one year period
Linearity (variation of gain with input level)	$\pm$1 dB (level range -50 to +3 dBm0)
End-to-end frequency response[6]	$\leq$ 0.9 dB loss (300 - 3000 Hz)
Group delay distortion[6]	$\leq$ 1.5 ms (500 - 2800 Hz)

DATA TRANSMISSION SERVICE

The G.703 co- and contradirectional, 64 kbps interface module has two bi-directional E&M signalling channels for requesting the services of trunks using the demand access mode.

ITU-T/EIA	Data Rate (kbps)	Data Rate Selection
Synchronous		
• V.24/RS-232C	2.4 - 19.2	Remotely programmable
• V.11/RS-422A	2.4 - 64.0	Remotely programmable
• V.35	2.4 - 64.0	Remotely programmable
• G.703 co- and contradirectional	64.0 (E&M$_1$; E&M$_2$)	Fixed
Asynchronous		
• V.24/RS-232C	1.2 - 19.2	Selected through jumpers

Synchronous and asynchronous data circuits running at the same data rate can be submultiplexed to occupy a single 64 kbps trunk. The number of data circuits per trunk is dependent on the data rate:

An SR500-s system supports any mixture of data circuits running at different data rates.

Data Rate (kbps)	Data Circuits Per Trunk	Data Rate (kbps)	Data Circuits Per Trunk
1.2	20	9.6	5
2.4	20	19.2	2
4.8	10	38.4 to 64.0	1

Network Management

Continuous Quality Testing

CS

SLIM
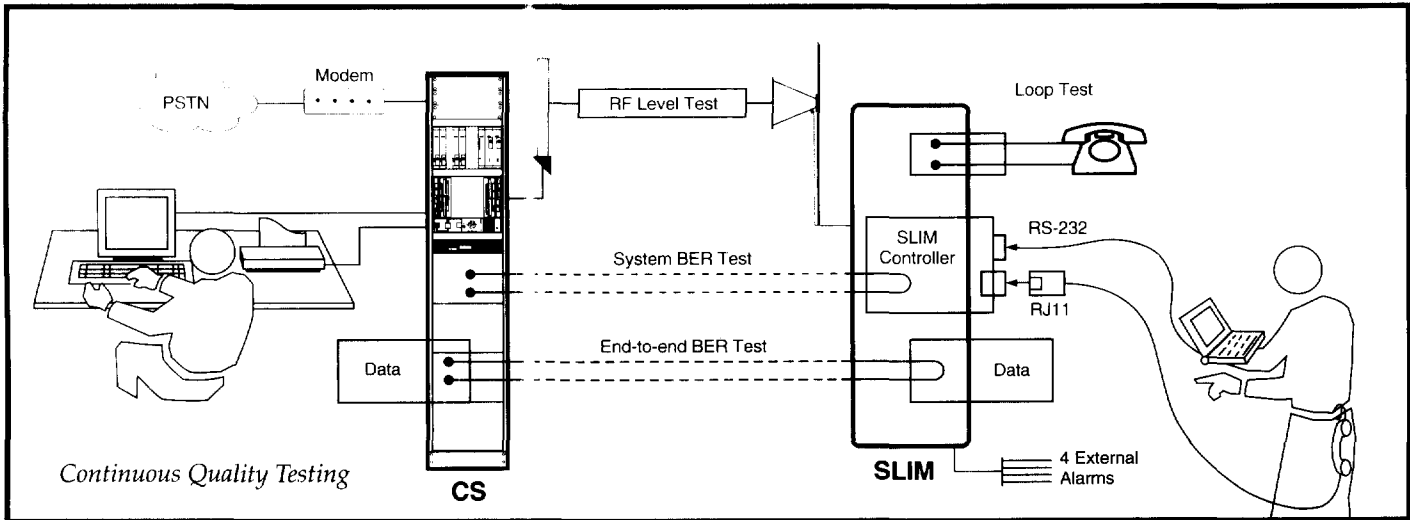
OPERATION AND MAINTENANCE

The SR500-s includes a comprehensive set of tools and features for managing the network. Included are:

- on-line diagnostics;
- real-time monitoring and alarm-reporting subsystems;
- menu-driven user interface;
- automatic identification of system configuration;
- dynamic line addressing;
- four security levels.

Access to these powerful tools and features is via a video display terminal or any type of PC, located at the central station site or anywhere on the public switched telephone network (PSTN).

ALARMS

All SR500-s stations have built-in alarms that report failures in the transmission, controller, and power subsystems. All alarms are reported to the central station which, in turn, provides notification to the network manager through visual indicators, error messages, and dry-contact relays (NO or NC).

CONTINUOUS QUALITY TESTING

Compliant with the ITU-T G.821 recommendation, the SR500-s CQT facility provides network managers with a range of tests that verify the quality of the network. Included are BER tests, RF level tests, and loop tests.

System BER Tests (optional) - verify the quality of transmission between the central station and any remote station. It can test one remote station, all remote stations using the same trunk, or all remote stations using two trunks.

End-to-end BER Tests (optional) - exercise the circuit between two synchronous data connections, the one at the central station and the corresponding one at the remote station.

RF Level Monitoring (optional) - enables system nodes to report the strength of the RF signal being received from downstream remote stations. Reporting is done in real time, and the signal level is measured in dBm.

Loop Tests - verify the integrity of the copper loop connecting the 2-wire interface module to the subscriber's telephone. It can test a single loop, a range of loops, or one or more loops at a specific time (programmable).

All tests are built into the SR500-s system and require no additional test equipment. They can be initiated from either the local or remote video display terminal and can run in the background while the user performs other menu-driven functions.

Test results can be printed, stored on the mass storage unit, or just displayed in real time.

ORDERWIRE

The orderwire option provides maintenance personnel with a service channel that they can use when co-ordinating activities amongst themselves. Through this channel, they can place a call to a particular station or broadcast a message.

MASS STORAGE UNIT

Effective network management requires large storage capacity for system status, alarms, test results and traffic statistics. The central station provides a solid-state, mass storage unit that can store event reports up to six months. Reports can also be sent to an external printer, PC or transferred to a portable 4 MB flash memory card for retrieval at some later time.

Information subject to change without notice.
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8